CITY OF LOWELL
OPEN SPACE AND RECREATION PLAN

Office of the City Manager
Division of Planning and Development

DRAFT

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SECTION 2: INTRODUCTION

A. Statement of Purpose

The 2004 Lowell Open Space Plan is a rewrite of the 1994 Plan, which was prepared by the Northern Middlesex Council of Governments. The City of Lowell is almost built out to maximum capacity. The City needs to act to conserve any open space that is left before it is developed. Most of the undeveloped land in Lowell is in floodplain areas or in wetland resource areas. Although the Conservation Commission works extremely hard to protect these areas the developers and engineers are becoming more creative in their ways to build in the floodplain, as long as performance standards are met and the Wetlands Protection Act is followed they will be able to develop these areas.

The City has transferred control of an 8.5 acres parcel of riverfront property to the Department of Environmental Management for the construction of a boat ramp. The construction was completed in the spring of 2004. The City also acquired 8.5 acres of land on Edwards Street where new soccer fields were created. The Lowell Parks and Conservation Trust constructed a new ¼ acre park on the Concord River. The City is working with the Lowell Parks and Conservation Trust to establish the Concord River Greenway, which will eventually connect to the Bruce Freeman Trail in Chelmsford and will connect with several parks and the downtown walking trails.

The City of Lowell has been on the right tract and we are trying to keep the momentum going by identifying priority parcels for acquisition.

B. Planning Process and Public Participation

The City of Lowell received a grant as part of the Route 3 widening project to hire a consultant to conduct a phone survey. The City hired Davidson-Peterson Associates (DPA) of Kennebunk, Maine to conduct the survey. DPA surveyed a total of 261 Lowell residents on November 1 and November 10, 2002. Interviews were conducted in English, Spanish and Khmer. A total of 224 of the respondents were recruited at random. In addition a listed sample of Cambodians was used to augment and assure a robust sample of this ethnic group. A total of 37 Cambodian respondents were recruited through the purchase of a phone list

SECTION 3: COMMUNITY SETTING

A. Regional Context

Lowell, Massachusetts, the nations first successful planned industrial community, is located in northern Middlesex County in the northeastern section of Massachusetts. The city is located approximately 25 miles north of Boston. The total area within Lowell's city border is 14.27 square miles. Of that number, the land area is 13.38 square miles with the remaining 0.89 square miles covered by surface water. The major bodies of water that have had tremendous impact on the development and success of the City are the Merrimack and Concord Rivers, which intersect near the Downtown.

Lowell is a diverse urban/suburban community built primarily around the extensive industrial mill complexes along the Merrimack River. The Industrial Revolution of the 19th Century gave the City its economic base, heritage, and character that are still prevalent today. Today, the City can be characterized as a highly urbanized community surrounded by wealthier suburban white-collar communities. In contrast to Lowell, the neighboring suburban communities of Tewksbury, Chelmsford, Dracut, and Tyngsborough have extensive open land, a testimony to their rural, agricultural past.

Lowell established a priority to restore and recapture its historic past through many public sector initiatives. Restoration of the historic mills and canals in Lowell's downtown have been undertaken through a

cooperative public/private effort between the Federal Government, the Commonwealth, the City of Lowell and the Lowell Plan. This cooperative agreement lead to the Lowell National and State Heritage Park system that has attracted millions of tourists from all over the world since its inception. Open space systems such as these are in high demand not only by local residents but also by many visitors from throughout the state and nation who enjoy the valuable historic resources found in and around the City of Lowell.

B. History of the Community

The "Venice of America", as Lowell was known, was remarkable among 19th century industrial cities for its quick ascent to fame, the symbolic value it held for America, and the sheer enormity of its industrial processes. The physical remains of Lowell's industrial past – 5.6 miles of canal ways, lock chambers, mills, boarding houses, bridges, and machinery – are monuments to the American Industrial Revolution. This success largely rested on certain advantages of people, place and timing.

Lowell was America's first large scale planned industrial community. It was incorporated as a city in 1826. By 1840, Lowell had become the principal manufacturing center of the United States and a model for many similar ventures. The transformation from rural community to industrial mecca occurred in less than two decades, one of the most rapid industrialization processes the country had ever experienced.

Lowell's geographical location at the confluence of the Merrimack and Concord Rivers attracted settlers to its banks for approximately 10,000 years. The site first served as an ideal location for Native American fishing camps and then to early English settlers who made use of the rich farmland along the rivers' floodplains. During the Industrial Revolution, the two rivers provided an abundance of inexpensive yet reliable waterpower for the mills. The level terrain and convenient access to Boston via the Middlesex Canal and to Newburyport via the Pawtucket Canal and the Merrimack River were also geographical advantages that drew settlers.

Lowell's city designers designated mill sites and canal routes as their highest priority. To facilitate the use of river power, mill complexes were constructed along the banks of the Merrimack and Concord Rivers, where the force of the watercourses were greatest. As more corporations were founded, an intricate system of canals continued to evolve to provide the necessary power. Eventually, 10 canals were constructed, cutting up the City into seven islands as they fanned out across the landscape. The rest of the community developed within the confines of the V-shaped wall formed by the mills. The corporations established residential communities to house mill employees, which led to the formation of ethnic neighborhoods.

With the expansion of the mills during the 1830s and 1840s, a large middle class grew in three adjoining areas. Chapel Hill was the first neighborhood to develop. Development then spread to the Belvidere section of the City. In 1834, the remaining land above Nesmith Street was annexed to Lowell, which was then sold to developers to build expensive homes during the 1840s. Centralville was settled next and was annexed to Lowell in 1851. The introduction of the streetcar in the 1890's led to the development of Lowell's outlying areas, such as Tyler Park in the Highlands neighborhood. Pawtucketville became a part of the City in 1874.

By the 1860s, Lowell could not keep pace with the very forces of the industrial system it had generated. As the 19th Century progressed, conditions in mills and corporate boarding houses became worse as overcrowding became prevalent. Tenement buildings were constructed throughout the city, and the neighborhoods grew to their present size. Shortly after the turn of the century, Lowell's status diminished when the use of alternate forms of power production became widespread. It was practical for many aging textile companies to move south where raw materials and labor were less expensive. For several decades, the City's economy stagnated and the mills and canals fell into disrepair. It would be many decades before efforts were initiated to reuse these impressive facilities.

With its canal system, mills, 19th Century architecture, and ethnic neighborhoods, Lowell is today a living museum of the American Industrial Revolution. Recognizing the significance of Lowell's environs, the Federal and State governments have established cultural parks in the city. Together, these park projects

establish the context and set both the tone and pattern of Lowell's renewal. The various programs seek to revitalize Lowell and preserve the City's heritage and manmade environment through adaptive reuse. The City requested the Legislature to enact a special statute that would protect historic buildings and the substantial public and private investments needed to rehabilitate them. This statute established a consolidated downtown district in Lowell and a local review board known as the Lowell Historic Board (LHB), a section of the City of Lowell Division of Planning and Development. The LHB sets preservation standards to guide future work and a permitting process that ensures consistency with the standards. Local. State, Federal, and private sectors have become partners in protecting and promoting Lowell's historic resources.

1. Historic Resources

Located within the City are seven historic districts on the National Register of Historic Places. These areas led to the historical and cultural resources that are so prevalent throughout the City and add to the quality that is inherently Lowell. These districts are described below.

Wamesit Canal/Whipple Mill Historic District
The Wamesit Canal/Whipple Mill Industrial complex, situated on the western bank of the Concord River opposite Lawrence Street, contains mill structures and hydroelectric power elements that date from the 1820s to the early 1900s. The Wamesit Canal is of national significance as an early nineteenth century engineering feat. In addition, the complex contains the Whipple Powder Works structural remains that represent the oldest extant industrial enterprise in Lowell.

Middlesex Canal Historic District
The Middlesex Canal, completed in 1803, is the oldest canal of its size built in the United States. The twenty-seven and one-quarter mile canal connecting the Merrimack River with Boston opened previously inaccessible markets and raw materials in the North to the trading center of Boston. Following the opening of the Boston and Lowell Railroad in 1835, the canal ceased to be a profitable operation. Middlesex Canal, however, continued to serve as a model in construction for future, more ambitious projects such as the Erie Canal.

South Common Historic District
The South Common Historic District lies southwest of the Lowell Center and it encompasses approximately 40 acres. The district is bounded by fine examples of mid-nineteenth century houses built for Lowell's growing merchant class. A variety of architecturally distinguished civic and institutional structures as well as internationally known mills are located here. The focus of the district is its 1845 common, significant as an example of early open space planning in the city.

Washington Square Historic District
Washington Square Historic District consists of 67 buildings in an urban residential setting located less than a mile from Lowell Center. District boundaries generally follow those of an 1832 subdivision plan of the west slope of Belvidere Hill, which initiated the area's development. Part of the crest of the Hill was reserved for the formation of a small park. The district was the home of many prominent citizens and remains as an ensemble of well designed mid to late nineteenth century residential styles.

Merrimack/Middle Street Historic District
The Merrimack/Middle Street Historic District is significant as the heart of Lowell's central business district. The area served and continues to serve as the vital corridor for retail and business transactions. During the first half of the nineteenth century when Lowell became America's first great industrial city, Merrimack Street developed as the City's primary commercial thoroughfare. By 1850, Lowell was the second largest city in Massachusetts and the largest cotton textile center in the United States. The Merrimack/Middle Street Historic District includes an important group of high and late Victorian commercial buildings. Other buildings represent commercial forms of Italianate, Second Empire, Romanesque and Renaissance Revival styles.

City Hall Historic District

The City Hall Historic District, comprising of 71 buildings dating to as early as 1823, contains examples of early commercial, governmental, residential, educational and religious structures. During the founding of the mill community, the City Hall District was the center of city development. The District contains buildings directly related to the mills such as private or boarding homes for mill owners, agents and workers. It also contains those buildings dependent upon by the mills such as governmental, commercial and religious structures.

Locks and Canals Historic District

The Locks and Canals Historic District encompasses all of the canals in Lowell (built between 1793 and 1848), their associated locks, and the mills powered by the canals. There are about five miles of canals and mills in this district of approximately 100 acres. Three boarding houses, not contiguous to the canals, but built by mill owners for their workers, are also included in this district. Properties located in the Locks and Canals Historic District include:

- Lock House
- Francis Gate House
- Sluice Gate House
- Northern Canal Gate House
- Northern Canal
- Northern Canal Walk and Great River Wall
- Locks and Canals Blacksmith Shop
- Moody Street Feeder Gate House
- Massachusetts Mills
- Massachusetts Mills Boarding House
- Boott Mills
- Lower Locks, Pawtucket Canal
- Lower Pawtucket Canal
- Upper Pawtucket Canal
- Pawtucket Dam
- Bigelow Yard
- Suffolk Millyard
- Suffolk Manufacturing Company Boarding Houses
- Tremont Gate House
- Tremont Yard
- Gate Keeper's Cottage
- Proprietors of the Locks and Canals Yard
- Hamilton Yard
- Hamilton Canal
- Eastern Canal
- Appleton Mills
- Swamp Locks
- Merrimack Canal
- Lowell Machine Shop
- Western Canal

Middlesex Canal

The Middlesex Canal, constructed in the early 1800s, ran from Charlestown to Lowell. This transportation system served as the first major connection between Boston and Lowell. Middlesex Canal was in operation until 1853. By then, the railroad had made the connection between the two cities, thereby eliminating any need for transport via the canal. Today, the 27-mile canal is in various conditions: in some places, obliterated by development; in other places, overgrown with vegetation; and in yet other segments, restored to its original condition. The Lowell section of the canal is virtually nonexistent. The prospect for a throughway along the canal in Lowell is slim because of alterations to the original route; infill in some sections; and major obstructions that would prevent a continuous corridor. Much of the canal has been lost to development, but the remaining sections have the potential to offer attractive recreational opportunities, which can be enhanced further by the proximity of the State and National park systems. Every effort should be made to develop pedestrian and bicycle connections between sections of the canal and other parks.

Tyler Park Historic District

The Tyler Park Historic District is the most recent addition to Lowell's list of historic resources. It was also added to the list of the National Register of Historic Places in 1989. Tyler Park is a section of Lowell that is roughly bounded by Foster, Princeton, and Pine Streets. It is located around a public park designed by Charles Eliot. The district is composed primarily of 1 to 2.5-story, wood frame dwellings. Most houses are excellent examples of carpenter built vernacular styles, though a few appear to have been designed by local architects. Most houses within the district occupy suburban style lots, generally with a small front yard and large side or rear yards, which is characteristic of a middle class neighborhood in this section of

Lowell. Approximately 386 buildings of historic significance are found within the Tyler Park Historic District.

The LHB has established a permitting process regarding the alteration, development, demolition and signage of buildings in the historic districts of the City. The process calls for the completion of applications forms, submitting plans to the Design Review Advisory Committee of the LHB, and a presentation before the regular meeting of the Historic Board. If the project is found to satisfy the design criteria of the board, a permit of approval is issued along with conditions for construction to the applicant. The applicant can then obtain a building permit from the city to begin construction. The board was formed to safeguard the historic structures of the city and to prevent further degradation of the remaining resources.

2. Archeological Resources

The area known as Lowell was in existence well before the Industrial Revolution. This region was popular with Native Americans and early settlers because of its water resources. The two rivers and the Pawtucket Falls proved to be valuable natural resources for hunting, fishing, and transporting goods to and from various markets. While much of this earlier history is overshadowed and forgotten due to the booming Industrial Revolution that occurred centuries later, archeological remains have been found in the region that describe life in Lowell in Pre-Industrial times. The Algonquin-speaking Pennacook Indians came to the Pawtucket Falls regularly to take fish from the Merrimack River. Numerous remains from these fishing and gathering sites have been found along the river.

C. Population Characteristics

According to the 2000 US Census, the City of Lowell had 105,167 residents, an increase of 12.5% since 1980 (92,418). Lowell has an ethnically diverse population, consisting of 67% white, 17% Asian, 14% Hispanic and 4% African American. The 2000 Census indicated that 11,313 residents are over the age of 65, 32,013 residents are under the age of 19 (30%) and 7,696 are under the age of 5 (7%). This Open Space Plan will aim to plan recreational opportunities for all ethnic and age groups, and physical abilities, being especially sensitive to the needs of seniors, children and the disabled.

The median household income in Lowell in 2000 was $39,192. There were 3,299 families that were below the poverty line. In May 2001, Lowell's labor pool consisted of 51,496 people. Of these, 2,691 were unemployed, giving Lowell an unemployment rate of 5.2%. This unemployment rate was up from December of 2000 when the rate was 2.4%.

D. Growth and Development Patterns

1. Patterns and Trends

Lowell witnessed its greatest population growth from 1890 to 1900. During this period, the textile mills began to prosper and new commercial and industrial enterprises appeared in the City, creating an increased demand for labor. In 1875, the Lowell experienced its first influx of immigrants in response to the new employment opportunities. Lowell's population increased 60% from 59,475 in 1880 to 94,969 in 1900. By the early 1900s, industrial production in Lowell had reached its peak. Lowell's population grew steadily as immigrants gradually replaced the early "mill girls" as the major source of labor. By 1920, Lowell's population had reached a high of 112,759.

The movement of the textile industry to the south and the resulting depression lead to Lowell's eventual economic collapse. Over the next decade, Lowell experienced its first significant loss in population, decreasing to 100,234 persons in 1930. The City's population remained stable throughout the Great Depression of the 1930s. Following the Depression and World War II, the population began a steady decline as residents began to move into the suburbs. Lowell's population decreased 10 percent from 101,389 in 1940 to 92,107 in 1960.

The present land use pattern of Lowell was greatly affected by the roadways, which existed prior to early industrial development. The City's location between Concord, New Hampshire and Boston made Lowell an important link in regional transportation long before the automobile and railroad. Its location at the terminus of two important waterway connections also spearheaded the development of this City. When Kirk Boott, the City's original town planner, arrived to execute his plan for Lowell, he preserved the original transportation network. Thus, as the City grew, farm and coach roads were forced to serve as the City's major thoroughfares. Today, these same roadways, with only minor surface improvements, are the principal arteries of Lowell's circulation system. These transportation arteries have taken development from the central business district and moved it to the surrounding suburbs. Today, little open space remains in this well-built environment. The largest blocks of undeveloped open space remain along the rivers and near the Lowell/Dracut State Forest; areas that should be further protected from potential development pressures.

Lowell is also plagued with dilapidated and abandoned buildings throughout the older and poorer sections of the City. With limited funds to demolish these buildings, blight continues to claim older buildings in the area. These buildings, if not of historical significance, should be demolished to allow for the creation of infill housing or small parks. Property values are proportionally related to the neighborhood's surroundings. Blighted buildings will only further lower the City's property values and property tax revenues. Thus, it would be in the best interest of the City to tear down these structures or repair them and allow for new, energy efficient buildings to be constructed in their place. A stable neighborhood is a productive neighborhood. The City needs to make this connection and work to clear unsightly structures and encourage new development in their stead. These parcels could also provide excellent locations for urban gardens, small tot lots, basketball courts, or congregating areas for families and the elderly. Such a program has been initiated in other cities where neighborhood groups have provided sweat-equity to maintain the parks and supervise the area.

Since there are few large open parcels still available, large-scale development in Lowell is predicted to be limited, except in the City's Pawtucketville neighborhood where some large tracts of undeveloped parcels still exist. However, pockets of infill development are occurring throughout Lowell as developers either destroy existing buildings to make room for new projects, or build in areas between present structures where available land exist. The lack of undeveloped land in Lowell makes land acquisitions for the City's public open space inventory more difficult because the City must compete with private developers in the purchasing process. An area of hope for Lowell is the large number of tax delinquent properties that the City could use for open space. The City must be creative in its methods of acquiring and securing open space and recreation parcels.

2. Infrastructure

a. Transportation Systems

The Lowell community is well served by a clean, modern and efficient public transportation system. This system includes local and regional bus routes, passenger commuter trains, a modern multi-modal transportation facility at the Gallagher Terminal, as well as regional highways, bridges and pedestrian walkways.

Commuter trains at the Gallagher Terminal provide convenient 40-minute travel service between Lowell and Boston's North Station with 21 trips per day. These trains also provide direct access to North Billerica, Wilmington, Woburn, Winchester, and Medford before arriving in Boston. A 12-minute shuttle connects the Gallagher Transportation Terminal with Downtown Lowell. In addition, 16 bus lines serve the City and the surrounding suburban communities. For those who do not have direct access to the Lowell Regional Transit Authority (LRTA) bus routes can connect to the commuter rail by taking advantage of the low cost parking garage at the Gallagher Terminal.

The City of Lowell is fortunate to be served by an excellent regional highway system that provides direct access to the Boston metropolitan area as well as key points to the west and north. Lowell is located at the heart of the Merrimack Valley just 30 miles northwest of Boston. To the northeast are Portsmouth, NH (48

mi.) and Portland, ME (97 mi.); to the northwest are Manchester, NH (38 mi.), Burlington, VT (212 mi.) and Montreal, Canada (252mi.); and to the south and west are Worcester, MA (38 mi.), Hartford, CT (103 mi.), and New York City (170 mi.). Lowell is located at the hub of the entire New England highway system, at the junction of Interstates 495 and 93 and Route 3. Interstate 95, connecting northern and southern New England and providing access to the entire Boston perimeter, is accessible in minutes from Downtown Lowell via the Lowell Connector. Interstate 90, New England's east/west corridor, is also easily accessible via Interstates 495 and 95.

Lowell has six bridges that carry cars, bikers, and pedestrians across the Merrimack River. These bridges are heavily used by residents and UMass Lowell students who travel between the different neighborhoods within Lowell, as well as pass-through commuters.

This excellent transportation system has translated into more jobs and services as companies have moved into the region to take advantage of the transportation networks, excellent labor force, and cheaper rent and land costs than Boston. While much of this development has mainly occurred in surrounding communities, Lowell has felt an impact through increased housing construction and increased through-traffic. The increased population in Lowell and in the region as a whole has resulted in growing pressures on the City's existing services and is placing greater demands on its remaining open space.

The City of Lowell has a number of existing walkways throughout the city. The most popular one is along the Merrimack River in the Pawtucketville section of the City. Hundreds of people enjoy the walk and the view of the river on a daily basis. The City has recently opened another walkway on the Merrimack River that connects the Tsongas Arena and the LeLacheur Baseball Field. The National Park Service also has a walkway along the canals in the Downtown area. The City is currently working with the Lowell Parks and Conservation Trust to develop a greenway on the Concord River that would connect to the Bay Circuit Trail.

b. Water Supply System

The Lowell water department was formed in 1872 and relies solely on the Merrimack River for supply. Conventional treatment is used with, sand, dual and carbon media filtration. Approximately 15mgd are pumped with a maximum capacity of 30-mgd. The Lowell Regional Water Utility (LWRU) is responsible for supplying all of Lowell residents with safe potable water. The utility also supplies water to Dracut, Tyngsboro, and East Chelmsford on a daily basis. Water on an as needed basis as well is supplied to Tewksbury, North Chelmsford and Chelmsford Center from its facility on Pawtucket Blvd. The other major user of water from the Merrimack is the Consolidated Power Company, which withdraws water to generate hydroelectric power The LRWU system includes two underground storage tanks with a capacity of 11 million gallons which are located on Christian Hill in the Centreville section of the city, the Stackpole, Newbridge, Tenth Street booster Stations as well as two free standing storage tanks located on Wedge St (1mg capacity), in the Highlands section of the city and on Fox St. (.4mg capacity.) located on Christian Hill. There are over 210 miles of water mains consisting mostly of 6-inch cast iron pipe supported by 8,12 and 24-inch cast iron transmission mains; Most of the mains are between 60 and 100 years old. Lowell has 2200 hydrants and 22,000 house, business and industrial services. Approximately 15% of the service pipes where determined to be lead or galvanized iron, we have been replacing them as quickly as possible.

The Merrimack River provides ample water for Lowell's existing and future water supply demands. Significant improvements have been made all along the Merrimack River Utility Basin, whereas twenty years ago fish were hard to find along the river. Today, trout, bass and pan fish can be found in abundant supply. Water quality has improved and the river has been designated a class (B) river which means it is safe for fishing, swimming and boating. As an aside the Utility sponsors a 2-mile race in the river every Fourth of July, however as development continues in the basin, major efforts are needed to manage existing and potential contamination sources.

Much of this clean up effort gained important significance when in 1988 the Environmental Protection Agency (EPA) established the Merrimack River Initiative. This program coordinates clean up efforts between New Hampshire and Massachusetts. Since its inception, millions of dollars have been spent to

update municipal sewage treatment facilities and to educate the public on the importance of water to prevent further degradation of the Merrimack River. This federal effort has trickled down to the local level where various students from area schools have been participating in water quality monitoring programs. Continued clean up of the Merrimack and Concord Rivers will result in expanding recreational opportunities for area residents and stimulating further economic development.

The Utility is in the midst of a 12.6 million dollar upgrade, which will keep in compliance with all present and future regulations as well as completely automate all the operations of the treatment plant.

c. Sewage Service

Lowell's existing sewer system consists of approximately 210 miles of sewer lines and 27 miles of drains. Eighty-eight percent of the sewers are combined sewers, carrying both drainage and sewerage. Problems inherent with combined sewer systems include raw sewage being dumped directly into the river during heavy rain periods. When the sewage treatment facility fills beyond capacity, the water is discharged directly into the Merrimack River completely bypassing the treatment plant. During wet periods of the year, this set up contributes to water pollution. The problem -- known as combined sewer overflow -- also exists in Nashua and Manchester, NH, and downstream in Lawrence and Haverhill, where the Merrimack is used as a public drinking water supply. All five communities are under orders from the federal Environmental Protection Agency to fix the overflows, which are the result of storm water and wastewater flowing into the same systems. In 2001, representatives from the five towns held a press conference to announce the formation of the Merrimack CSO Coalition, a collective effort to influence federal regulatory agencies to help the region deal with the overflows.

Lowell has a 32-mgd design capacity conventional activated sludge and treatment plant on Duck Island, serving the City of Lowell and the Towns of Dracut, Tewksbury, and a portion of Tyngsborough, a total population of 158,000 persons. The plant has the capacity to handle a peak flow of 64 mgd, and a peak primary flow of 110 mgd. In actual practice, a peak flow of only 50-mgd can be optimally treated to secondary and 100 mgd to primary standards.

Flow to the treatment plant travels through major interceptors along the Concord and Merrimack Rivers. The plant houses a computer that monitors the treatment processes and controls the amount of wastewater that reaches the plant to prevent overload. The system incorporates an override function so that the operator may manually control processes and operates equipment.

3. Long-Term Development Patterns

To control development, Lowell relies on zoning regulations, subdivision control laws, and the site plan review process. In December of 2004, the Lowell City Council adopted a revised zoning ordinance and map. These efforts came after the completion of the City's new Comprehensive Master Plan in 2003, which was the guiding document behind the changes made to the City's zoning. The revision of the ordinance includes a number of new procedures and regulations aimed at promoting and protecting neighborhood character in accordance with the Master Plan. The new map rezones the entire City using a new set of zoning districts that are described in section 3.1 of the new zoning code. The changes also place greater restrictions on multi-family housing and provide greater provisions for parking and open space. Given the lack of available land for development, provisions such as these will help to maintain open space for residents. Lowell is also working on updating its subdivision regulations which were last amended in 1983.

In addition to the regular land use controls, the city relies upon FEMA regulations regarding development in flood prone areas particularly around the Concord River and several other tributaries. The overlay flood plain district subjects proposed projects within floodplain boundaries (delineated as Zones A and V in Flood Insurance Rate Maps (FIRM)) to closer scrutiny.

In the last five years, Lowell has seen some of its last remaining large open space parcels developed into single-family subdivisions. Lowell lost more than 32 acres due to 3 subdivisions alone. Coincidently all these projects were in the same section of the city. At the end of 2002, a 20-lot subdivision off of Mary

Teresa Terrace was approved by the various boards of the City. Two parcels of land, each containing a single-family home, were combined to create an 8-acre lot. The two single-family homes were demolished and 20 single-family homes were constructed in their place. In the summer of 2003, two more large subdivision projects were approved. Manor View Estates off of Varnum Avenue was a 7.2-acre nursery that was converted into 11 single-family homes. Also approved was the Enchanted Forest subdivision project in the same year. This project was built on 17 acres of land, which had been Chapter 61 farmland. The City and the Lowell Parks and Conservation Trust had the right of first refusal on the property; however, neither one could afford the property. As a result 17 acres of prime real estate abutting the Lowell-Dracut-Tyngsboro State Forest was sold to a developer who is in the process of building 36 homes. The City was able to work with the developer and have him agree to donate a portion of the land to a land trust, but many neighboring residents agree that the City could have taken more ownership to guide the direction of this project.

The following is a summary of the build-out statistics for the City of Lowell.

SUMMARY BUILDOUT STATISTICS[1]

(New Development and Associated Impacts)	
Additional Developable Land Area (sq. ft.)	53,929,774
Additional Buildable Lots	2,651
Additional Dwelling Units	5,495
Additional Commercial/Industrial Buildable Floor Area (sq. ft.)	23,719,468
Additional Water Demand (gallons/day)	2,677,472
Additional Residential Water Demand	898,512
Additional Commercial/Industrial Water Demand	1,778,960
Additional Municipal Solid Waste (tons/yr.)	10,516
Additional Non-Recyclable Solid Waste (tons)	4,370
Additional Recyclable Solid Waste (tons)	6,146
Additional Residents	11,980
Additional School Children	2,033
Additional Roadway at Build Out (miles)	20

If the City were to be at full build-out the only open space that will remain will be the following list of parks that have been given to the City under perpetual protection.

Site Name	Acres
ALUMNI FIELD	5.94
BOATHOUSE SITE & GREENWAY	4.28
EDSON CEMETERY	50.95
EDWARDS STREET PARK	6.10
FRANCIS GATE PARK	11.42
HAMBLET CEMETERY	0.54
HILDRETH FAMILY CEMETERY	2.25
HUNT CEMETERY	0.66
JANAS SKATING RINK	7.95
LOWELL CEMETERY	82.64
LOWELL HERITAGE STATE PARK	118.0
McDermott RESERVOIR	17.14
MERRIMACK RIVER BIKE PATH	1.01

[1] Community Preservation Resource CD, Municipality of Lowell, Fall 2000

OLD CEMETERY	0.53
OLD ENGLISH CEMETERY	6.26
PAWTUCKETVILLE CEMETERY	0.20
POLISH CEMETERY	7.83
REGATTA FIELD	22.29
RIVER GREENWAY	0.30
RIVERFRONT PARK	5.00
SCHOOL STREET CEMETERY	1.11
ST PATRICKS CEMETERY	38.24
ST. PETER'S CEMETERY	23.19
VANDENBURG ESPLANADE	0.62
WESTLAWN CEMETERY	38.66
WOODBINE CEMETERY	0.76
WYMAN BIRD SANCTUARY	9.08
Total Acres	462.95

Although 463 acres may seem like a lot of open space it should be noted that one quarter of that number is located in the Lowell Dracut Tyngsborough State Forest and 253.8 acres is cemetery land. It was projected in the Community Preservation Resource CD that at buildout Lowell would have 112,794 residents. According to the 2000 Census Data Lowell currently has 105,167 residents. If you deduct the amount of cemetery land from the total acres at today's population you would have less than 2 acres per 1000 resident of open space. Keep in mind that with total buildout the population would grow accordingly.
See Attached map of total buildout.

SECTION 4: ENVIRONMENTAL INVENTORY AND ANALYSIS

A. Geology, Soils and Topography

Lowell is a city of hills and valleys with a maximum land relief of 250 feet. The low point of 50 feet above mean sea level (msl) is at Duck Island along the Merrimack River. The higher elevations are concentrated in the eastern portion of the City. Christian Hill rises to an elevation of 300 feet above msl. Other prominent topographic features include Fort Hill, north of the Lowell Cemetery, which rises rapidly to 270 feet above msl and contains a scenic park. To the northeast of the park is a residential area in the neighborhood of Belvidere, which reaches 260 feet above msl and is the site of a fire suppression reservoir, which was constructed by the proprietors of the locks and canals to protect the mills. In general, the remainder of the City is a plateau surrounded by elevations of 100-250 feet.

The former landfill located near the Drum Hill Rotary, was previously capped and could be a potential recreation site. This mound of refuse is approximately 200 feet high and offers excellent views of the region as well as downtown Boston. The area could become a ski hill or an elevated picnic and play area. After all the hazardous materials have been cleaned up and disposed of properly, the potential for a park is possible. This form of recreational site has been attempted at other locations and found to be successful.

The Merrimack and Concord Rivers are the major features, which define the landscape of Lowell. The Merrimack River flows easterly through the northern portion of Lowell and drops approximately 60 feet in its eight-mile course through the city. The river drops 30 feet over the three-mile stretch of Pawtucket Falls. The Concord River flows northerly through Billerica and enters the Merrimack near the Bridge Street Bridge northeast of Lowell Center. The Concord River’s gradient drops very little over most of its length from Concord to Billerica and the floodplain tends to be broad. However, once in Lowell, the Concord River drops markedly as is evidenced by the three sets of falls along the river and the relatively narrow floodplain.

It is in this area where the Concord River has found new life as a recreational resource. Canoeists and white water rafters have discovered the turbulent water during the spring high water period. This area has

recently hosted several white water rafting competitions. The city needs to capitalize on the recreational resource now to garner support for preserving the banks along the Concord River for parks and boat launches. In its effort to improve and take advantage of this opportunity, the city is moving ahead with the Concord River Neighborhood Trail project that will enhance access to this area of the river. The Concord River Neighborhood Trail will connect to the Bruce Freeman Trail in Chelmsford and to the larger Bay Circuit Trail. The City in association with the Public Access Board is creating a canoe launch on Billerica Street for greater access to the Concord River.

The soils of Lowell are partially composed of deposits consisting of stratified sands and small amounts of silt and gravel found along the watercourses in Lowell. Bordering these deposits, and comprising the greatest extent of superficial material, is ice-contact deposits. These consist of stratifies sand and gravel with some silt, clay, and a few isolated boulders. The overall stratified material tends to follow the preglacial Merrimack River Valley, which extends southeast from the present valley. The ice-contact deposits are over 140 feet thick in places. Higher elevations are almost exclusively composed of glacial till. Till is a conglomeration of unstratified clay, sand, silt, gravel, and boulders that overlie the bedrock found through the region.[2] See Map 2

B. Landscape Character

The landscape of Lowell is characterized as an urban setting with several geological features that lend to its attractiveness. While much of the city is highly developed, Lowell does offer many attractive vantagepoints that are appealing to the eye. The many hills of Lowell allow for a varied view of the city and contrast nicely with the flat relief around the two rivers. The two jewels of the city, the Merrimack and Concord Rivers, gave the city it's founding and led to the birth of the Industrial Revolution. These two rivers served as the backbone for Lowell and the region's economy. Today, they continue to do so but also provide the city with a valuable recreational resource.

Water was and is essential to Lowell's existence. In the past, mill owners damned, ponded, and built canals to control the flow of the water to ensure a continuous source of power. However, manmade controls did not guarantee power. Lowell's industrial life was sustained by naturally falling water. At Pawtucket Falls, just above the Merrimack's junction with the Concord, the river drops more than 30 feet in less than one mile. This drop in water level created a continuous surge of power to drive turbines for the mills. Without the falls, there would have been no textile production, no Lowell as we see it today. Today, the rivers provide necessary drinking water and a multitude of recreational resources. Map 3 identifies those special scenic resources that lend to the physical character of the city.

C. Water Resources

1. Watersheds

The City of Lowell is in the Merrimack River Watershed; it is also part of the Concord River Watershed. Some of the smaller watersheds would be around the many brooks in Lowell including Clay Pit Brook, Beaver Brook, Black Brook, and Humphrey's Brook. The City works with the Merrimack River Watershed Council to protect the river and brooks. The MRWC does stream and river monitoring and cleanups. The City of Lowell also participates in river cleanups with the Lowell Parks and Conservation Trust. The City of Lowell has a Local Wetland Ordinance, in addition to the Wetlands Protection Act, to protect the wetlands of the area.

2. Surface Water

The Merrimack River is the major water body found in Lowell. This river is formed by the confluence of the Pemigewasset and Winnipesaukee Rivers in Franklin, New Hampshire. The river flows southward through New Hampshire to Tyngsborough; Massachusetts then turns northeastward when it reaches

[2] USGS Surficial Geology - Lowell, Billerica, Nashua - South Quadrangle

Lowell. The river empties into the Atlantic Ocean at Newburyport after flowing through Lowell, Lawrence and Haverhill, three major cities, which historically relied on the river for power and transportation.

The river falls more than 90 feet during its 116-mile flow through Massachusetts. The river drains a land area of 5,010 square miles; 1,210 square miles of this basin are located in Massachusetts. The water contributed by this vast drainage area is recorded by the United States Geological Survey (USGS), which maintains a flow gage just above the Hunts Falls Bridge. The gage location allows it to account for water received by the Merrimack's largest tributary in Lowell, the Concord River. Average flow at this site is 7,610 cubic feet per second (cfs) over a 66-year period of record, while the average flow for 1992 was 8,071 cfs. Maximum flow in 1993 was 23,5000 cfs recorded in March, while minimum flow in the same year was 2,080 cfs, recorded in July. These extremes occurred in March and July respectively, which indicates the annual variation of precipitation. The March figure is typically influenced by a reduced demand for water, heavy rain and snow melt. The July figure can be attributed to the dry summer month and increased human consumption.

The Merrimack River in Lowell has two access points. The boat ramp at the Bellegarde Boathouse is a private ramp used by the sailing program and the U-Mass Lowell crew team. The other boat ramp adjacent to the Vandenberg Esplanade is open to the public. During the summer numerous boats access the river through this ramp for the purpose of fishing, water-skiing, tubing, or just taking a leisurely ride up the river. A third boat ramp is up the river just passed the Rourke Bridge began construction in April 2003.

The Concord River originates at the confluence of the Sudbury and Assabet Rivers, and flows approximately 16 mile from Concord through Carlisle, Bedford and Billerica before it enters the Merrimack River at Lowell. The river drops 12 feet in the first 15 miles, then falls 50 feet in the final mile through Lowell. The drainage area for the Concord River basin is 62 square miles. The Old North Bridge of Revolutionary War fame is situated along this river in Concord, as is the Federally designated Great Meadows National Wildlife Refuge that is a vast land area in the towns of Sudbury, Wayland, Lincoln, and Concord. A USGS gauging station located near the confluence of the River Meadow Brook and the Concord River records flow of the river. The average discharge over a 53-year record period is 640 cfs. In 1993, the highest flow recorded was 1,360 cfs in November and the low flow was 101 cfs in September.

The Concord River is the site of some the best white water rafting in the state. Every spring the Lowell Parks and Conservation Trust run white water rafting trips down the Concord River. The season is usually sold out before it even starts. The Public Access Board is building a canoe ramp to provide access to the Concord River at 5 Billerica Street. Local residents have used the site for many years but now will be more accessible to everyone.

The second major tributary to the Merrimack River in Lowell is the Beaver Brook. The brook originates in New Hampshire and meanders southward through Dracut before flowing into the Merrimack River just east of the Pawtucket Falls. Additional tributaries of importance are located in the western part of Lowell. Black Brook begins in a wetland area of North Chelmsford. The brook flows northward, passing through the Middlesex Village area of Lowell before entering the Merrimack River. Claypit Brook originates from a vast wetland in the Lowell/Dracut State Forest in Dracut and initially flows southward. After turning eastward, the brook expands into a small pond before continuing as an outlet stream, which flows into the Merrimack River west of the Pawtucket Dam. Scarlet Brook is a small tributary that originates in Tyngsborough and flows southward to compromise a portion of the Tyngsborough/Lowell border before entering the river. Flagg Meadow Brook, which originates in the Lowell/Dracut/Tyngsborough State Forest, is also a small tributary of the Merrimack River.

River Meadow Brook is the main tributary to the Concord River in Lowell. It begins in a vast wetland region located south of Chelmsford Center and receives a large amount of water form a wetland body, Hales Brook, located east of Route 3 and north of Route 129. It flows into the Concord River near Rogers Street. Periodic flow rates have been recorded along this river several times. A sample taken in 1992 recorded a flow rate of 12.7 cfs.

Besides the two rivers and several brooks, Lowell is also interlaced with canals that have been in existence since the Industrial Revolution. All of the canals: Eastern Canal, Pawtucket Canal, Northern Canal, Western Canal and the Hamilton Canal are fed by the Merrimack River. The Pawtucket Canal was originally constructed as a transportation route around the Pawtucket Dam. The other canals were later constructed as branches of the Pawtucket Canal to feed additional mill complexes that wanted to use the power of the Canal. This power was generated through the controlled release of water through a series of dams along the canals. Today, Lowell's canals have the capacity to generate 22 megawatts of hydroelectricity.

Renewed interest in the canal system for recreational purposes has been prompted by the state acquisition of the canal system and by public/private ventures working together to clean and restore these historic transportation networks. The National and State Park systems currently operate tour barges along the canal as part of the National Historic and State Heritage Park Program. Maintaining and cleaning the canals will enhance the experience for park visitors and allow for further interpretation of the industrial Revolution. Map 4 identifies all water resources found in the city including surface water, wetlands and flood hazard areas.

3. Aquifer Recharge Areas

Since the City of Lowell relies on the Merrimack River for drinking water, there are no specific areas for ground or surface water recharge. The water that does filter through the soils in the many wetland environments recharges the Stony Brook aquifer and other designated aquifers in the region. Several public wells in the neighboring communities rely on recharge areas contained in wetlands found in Lowell. While the city does not depend upon ground water supplies, other communities do in the region. Two public wells in Chelmsford have designated Zone II's that lie within the Lowell Border. The wetland bodies located near Route 3 collect water for the underground storage areas. Even though the Lowell residents do not rely on these various wetland bodies for water supplies, efforts should be made to protect them and buffer the water bodies from harmful encroachment.

4. Flood Hazard Areas

Flooding often occurs in the Lowell area during the spring because of the snowmelt and spring rain showers. Due to over development, much of the important flood storage area have since been filled and developed. These wetland bodies provide valuable water storage areas for impervious surface runoff. When these stream channels can no longer accommodate increased discharge, water is carried on the flat valley floors or "floodplain" adjacent to rivers, streams and other surface water bodies.

Urbanism in a watershed changes the watershed's response to precipitation. The most noticeable effect is the significantly higher rate of runoff resulting from the increase in construction and parking lots. Whereas natural lands can readily absorb water and transmit it to the water table, impervious surface directs the flow of water and channels it to receiving sites. However, the rate of flow contributes to erosion and the water collects hazardous contaminants. The need to better accommodate automobiles has led to greater reduction in these valuable water storage areas.

Flooding in Lowell is a problem in some areas next to the Merrimack River. This is especially true along the northern bank near the Rourke Bridge. The Concord River also suffers from severe flooding. This past year saw many days above the flood levels especially in sections of Billerica and South Lowell. Many areas along Black Brook, near its confluence with the Merrimack River, have experienced flooding and erosion problems on an annual basis. Flooding along Marshall Brook has also been a problem in past years.

Efforts should be made to protect the remaining parcels of wetlands and prevent further encroachment. Eliminating these flood storage areas or reducing their benefits by restricting the waters movement can lead to further damage and costly improvements to property owners that result from severe flooding. In terms of recreation, these wetland resources provide habitats for birds and animals and could provide excellent

viewing spots for bird watchers and frog collectors. Refer to Map 4 for location of FIRM Area A and V flood hazard areas.

5. Wetlands

Wetlands provide numerous benefits to the community. These wetlands, which compromise a number of wet environments; marches, wet meadows, ponds, bogs, wooded swamps and other types of water dominated areas; provide many ecological resources. They help to maintain water supplies, purify polluted waters, check the destructive power of flood and storm water, nature wildlife and provide numerous recreational opportunities.

Most wetlands found in our urbanized area provide significant benefits in terms of preventing or reducing pollution in a variety of ways. Many of these ways are related to the great absorptive capacity of wetlands. Water can be stored or retained in wetland basins and released slowly into the groundwater. The vegetation in wetlands frequently acts to filter and trap sediments and heavy metals. By trapping these nutrients and minerals, wetlands can purify water and provide healthier environments for fish and plant life. The wetland plants that thrive in wet environments further enhance the pollution attenuation capabilities of wetlands by reducing biological oxygen demand levels, and lowering nitrate and phosphate levels.

A number of factors influence to what degree wetlands function in pollution prevention or reduction. These factors include wetland type, vegetative density, size, and gradient. The previously mentioned storage capacity of wetlands is important for their role in flood control and storm damage prevention. Wetlands can reduce the force and speed of floodwaters, which could cause property damage. In this way, wetlands provide a secondary function by reducing the floodwaters intensity that then reduces erosion. This factor is particularly important in highly urbanized areas such as Lowell where impervious surface intensifies water runoff.

Not only do wetlands provide important benefits for the urbanized environment, they are also necessary breeding and hunting grounds for plant and animal life. Many bird and mammals rely almost solely on wetlands and adjacent vegetative habitats for food, shelter, and reproductive purposes. The actual value as a wildlife habitat depends on the wetland vegetation composition and structure, size and hydrologic relationship. In addition, these habitats provide important recreational opportunities for hunters, fishers, bird watchers and boaters as well as hikers, photographers and environmental educators. Without these important resources, many of our recreational opportunities would quickly disappear if further protection were not pursued.

In Lowell, the wetlands are generally shrub swamps or areas forested with hard wood species. The larger wetland areas of approximately 10 to 25 acres are present in the Lowell/Dracut/Tyngsborough State Forest, along the old Middlesex Canal, Black Brook and portions of the Merrimack and Concord Rivers' floodplain. Other minor wetland locations can be found around the Cross Point Towers parking lots, near Wood Street and Westford Street, several locations along I-495 and near the Cawley Stadium (Route 38). There are several other wetland locations dispersed throughout the city.

Efforts should be maintained at protecting these valuable resources especially along the Concord and Merrimack Rivers to preserve the protective ability of wetlands.

D. Vegetation

1. General Inventory

Hardwood species are dominant in the Lowell Dracut Tyngsborough State Forest. The white pine predominates in sandy soils while hardwood and hemlock species are found in looms and fine sandy looms. Dominant hardwood species include red and sugar maple; red, white, black and scarlet oak; white, black and gray birch; white ash; beech; butternut; sweet pignut and shagbark hickory; and American elm. On upland sites with rich, moist soils, white pine, maple, oak, hickory, birch, beech, and ash are common. Dry, well-drained sandy soils are predominated by pitch pine, white pine, gray birch, and white and scrub

oak. Understory vegetation of the hardwood forest includes tree saplings and shrubs such as blueberry, mountain and sheep laurel, maple leaf viburnum, and smooth arrow-wood. Areas of open fields not under cultivation include grasses such as foxtail, broom bear, redtop, fescue, orchard, Kentucky blues, and timothy. Herbaceous and woody field species include red field clover, wild carrot, meadowsweet, yarrow, goldenrod, hairy vetch, lady's sorrel, asters, cinquefoil, sweet fern, pigweed, dandelion, and ragweed. Marshes, swamps, and floodplains are terrestrial ecosystems, which are particularly sensitive to environmental changes and thus may be severely impacted. Marshes and swamps are land areas, which are continually inundated with water, or which continually have groundwater levels at the ground surface.

Marshes, unlike swamps, do not have trees or shrubs and are characterized by grasses and sedges such as cattail, pickerel week, arrowhead, spike rush, bulrush, umbrella sedge, reed, reed canary grass, smartweeds, swamp milkweed, and water plantain. Swamps are dominated by wetland trees (red maple, black gum, black willow, and black oak) and shrubs (speckled alder, pussy willow, skunk cabbage, sweet pepperbush, water hemlock, elderberry, jewelweed, silky dogwood, violets, and water pennywort).
Floodplains, which may include swamps, marshes, and water-tolerant forests, are adapted for their periodic wet existence. Floodplain trees such as black willow, cottonwood, and silver maple are particularly adapted to withstand flooding.

2. Forest Land

Urbanization of Lowell over the past century has resulted in significant loss of vegetation. According to the 1985 Massachusetts Land Cover Map, the western portion of the city contains well-forested areas. Hardwood species are dominant in and surrounding the Lowell/Dracut State Forest. The State Forest is over 1,000 acres in area of which 259 acres is located in the city. Mixed hardwoods and softwoods exist south of this area in the region of two additional state forestlands. In the western portion of the city, there are relatively dense, forested areas along the banks of the Merrimack River.

3. Agricultural Land

There is one parcel in the city that is protected under Chapter 61A regulations. This Massachusetts law allows a landowner that farms his land to pay a lower property tax. The tax is based on the lands present use as opposed to its often more valuable future us such as residential or commercial. A landowner must have at least 5 acres of contiguous property in order to qualify. The 61A landowner uses his property for the production and sale of corn. Other parcels in the city were protected under Chapter 61A but have since been withdrawn to allow for residential development. It is unlikely that any other parcels will be designated as agriculture. Preserving land for agriculture is difficult in Lowell as the alternative is too profitable and the city lack adequate land use measures to protect such agricultural activity.

4. Rare, Threatened and Endangered Species

The Massachusetts Natural Heritage and Endangered Species Program (MNHESP), which maintains records of the States rare and most vulnerable natural features, has record of six historical rare plant species occurring in Lowell. These species, shore sedge Carex Lenticularis, Indian paintbrush Castilleja Coccinea, arethusa Arethusa Bulbosa, Melscheimer's sack bearer cicinnus Milsheimeri, tufted hairgrass Deschampsia Cespitosa SSP Glauca, and hardy wild rice Elymus Villosus were last seen over 100 years ago. The Arethusa, Shore Sedge, Melscheimers Sack Bearer, and Hardy Wild Rice are all on the threatened list while Tufted Hairgrass is listed as endangered and the Indian Paintbrush is listed as historical. The MNHESP has no record of any rare plant species currently existing in Lowell. The MNHESP recommends that further study be completed in Lowell to identify more occurrences of rare plants or animals.

Some sections of the Lowell/Dracut/Tyngsborough State Forest should be noted for their unique plant environments that warrant further research. The Natural Heritage Program has identified a priority habitat that are possibly containing state listed rare species. Further research work is needed to determine what species actually exist in this unique environment. This area is located in the state forest and includes land

in Lowell, Dracut and Tyngsborough. Efforts should be undertaken to identify any rare plant or animal species residing in this section of the state forest.

E. Fisheries and Wildlife

1. Inventory

Despite Lowell's limited amount of open space, the landscape, particularly along the Concord and Merrimack Rivers, provide a varied wildlife population. Belted kingfishers, blackcrowned night herons, great blue heron, and green herons are common bird species sighted during the summer months. A rookery of black crowned herons was, until recently, located on the Great Bunt of the Merrimack River, a reach at the foot of the Pawtucket Falls where the river makes a wide bend and is joined by beaver Brook. Construction of a sewer interceptor in the area and vandalism of the birds' nesting trees have caused the herons to leave the site. The Bald Eagle has also been sighted in the city, especially during the fall migration period. As Bald Eagles are abundant in the river's estuary, nesting sites should be built along the Merrimack River. Discarded utility poles provide excellent nesting platforms for birds of prey and provide a way to recycle a necessary infrastructure component.

The State Forest contains a diverse habitat that supports squirrels, cottontail rabbits, red fox, various songbirds and fishers that have traditionally been absent but are now returning to the woodland areas of Lowell. Tributaries to Merrimack River have been home to beaver for a number of years as well as several types of waterfowl. The importance of wildlife habitat provided by wetlands has recently become a greater issue for determining wetland value.

2. Vernal Pools

There is one vernal pool that has recently been verified in the City of Lowell. It is off Elene Street in the Pawtucketville section of the city.

3. Corridors

A critical element to habitat survival is the vegetative corridor. Strips of undeveloped land provide essential links for animals and birds to move from one feeding spot to another. Uninterrupted open space allows wildlife to move about and reach other necessary habitats. Once development cuts off this link, animals ultimately face extinction as their habitat dwindles. Maintaining and protecting the vegetative corridor along the Merrimack River can provide wildlife with access to the broader undeveloped tracts located outside the region. The Concord River, with its thick vegetation on both banks of the river is another wildlife corridor used by birds and animals that should be maintained and protected. Protected riverbanks can help birds and animals move in search of food and shelter. These corridors can also provide excellent spots for Lowell residents to view nature in a highly urbanized setting. A completed salmon restoration project by the State has provided a fish ladder at the Pawtucket Dam on the Merrimack River and a fish elevation at the hydroelectric station. This lift and ladder system allows fish to continue their journey up river to spawning grounds in New Hampshire.

4. Rare, Threatened, and Endangered Species

The Natural Heritage and Endangered Species Program have determined that the following rare species exist in Lowell.

Taxonomic Group	Scientific Group	Common Name	State Rank
Butterfly/Moth	Cicinnus melsheimeri	Melsheimer's Sack Bearer	T
Vascular Plant	Carex Lenticularis	Shore Sedge	T
Vascular Plant	Deschampsia cespitosa Ssp glauca	Tufted hairgrass	E
Vascular Plant	Elymus villosus	Hairy Wild Rye	E
Vascular Plant	Liatris Borealis	New England Blazing Star	SC

State Rank - T=Threatened, E=Endangered, SC=Special Concern

F. Scenic Resources and Unique Environments

1. Scenic Landscapes

The City's most distinctive features are the Merrimack and the Concord Rivers. The wide Merrimack River contributes to a dramatic view and gives the city a general feeling of openness. The Merrimack River is classified as a Massachusetts Scenic River. The Pawtucket Falls, where the Merrimack plunges over the dam, is also a location of special interest. The more intimate Concord River, though heavily developed over much of its length in Lowell, provides many locations of natural beauty and historic interest. Recent efforts by the Commonwealth to have portion of the Concord River designated as a Wild and Scenic River clearly demonstrates the valuable resources and benefit of protecting this river. The Massachusetts River's Protection Act limits the distance in which development can approach a river to 200 feet unless a special permit is received.

Other scenic areas include the annual foliage viewed from the higher elevations in the city and the two large marshes that compromise approximately 30 acres located in the Lowell/Dracut State Forest. The Lowell Cemetery, designed after Mt. Auburn Cemetery in Watertown, is known for its distinctive plantings and tombstones.

Lowell's topography affords many scenic overlooks of the city. The summit of Fort Hill, at 270 feet, overlooks the Concord River and has good views of downtown Lowell. Gage Field also offers excellent views of the city. The neighborhood of Belvidere and views down the Merrimack River can be seen from the Christian Hill reservoir. Again, all these views are enhanced during the fall with the color change of the leaves

2. Major Characteristics or Unusual Geologic Features

An important area for recreational use and a unique environment for the region are the white water section of the Concord River near the confluence of the Merrimack River. In this short section of the river, the water level drops almost 50 feet providing excellent conditions for rafting and canoeing. Several competitions have already been hosted on this section of the water. To further enhance this section and the entire stretch of the river through Lowell, the Lowell Parks and Conservation Trust is working to identify parcel ownership, acquire easement grants, and develop conceptual plans. Residents' perceptions regarding the positive aspects of the river are limited as access problems prevent close interaction with the river. Lowell could capitalize on the attractiveness of the river and gain regional and national recognition for its excellent white water found on the Concord River by protecting the banks of the rivers, developing access points, and hosting major competitions for canoeist and rafters.

3. Cultural and Historic Areas

Lowell's historical past has been captured in many reuse and revitalization projects around the city as local, state, and federal officials attempt to preserve and recreate the significant historical past of Lowell. Lowell, the birthplace of the Industrial Revolution, played an important role in the economic success of the region over a century ago. As a result of this development, the unique mechanization techniques, and company town environment, many historical areas around the city have been preserved so that the present population can appreciate the innovations of the past. Most of these resources are located around the river and canal system of downtown Lowell where industry harnessed the power of the Merrimack River. As mentioned earlier, Lowell has numerous sections of the city that are protected with a National Register of Historic Places designation. Other reminders of the past can be found in the various neighborhoods where company housing was constructed to house the influx of immigrants seeking employment. The homes of Belvidere, where the mill owners resided, also attest to the economic prosperity generated by the mill complexes. Many of the single-family homes have been preserved in their original form. Another cultural resource that still exists is the lock and canals system that supplied the mill power. Riverboat tours conducted by the National Park Service enable visitors to experience the technological marvels of the past century.

4. Areas of Critical Environmental Concern

There are no designated Areas of Critical Environmental Concern (ACEC) in the Lowell area. The city has examined the necessary steps to apply for an ACEC designation but felt that sufficient resources are not available to warrant this type of protection. However, this does not mean that certain areas around the city are not worthy of further protection. The city needs to be aware of the value to residents, plant life, wildlife and industry provided by the rivers and streams of Lowell. The Merrimack and Concord Rivers, the several brooks that feed into these locations are all-important to the residents of Lowell and should be protected through various methods.

G. Environmental Challenges

1. Hazardous Waste Sites

It is challenging in Lowell to create new open space due to the fact that many of the vacant lots in Lowell are Brownfield sites, which means that there is real or perceived contamination. Currently in Lowell there are 36 sites that are proceeding with an active cleanup of hazardous waste. There are 102 sites in the city that have a permanent solution in place without any activity use limitations. There are an additional 15 that have a permanent solution but do have activity use limitations. There are also several known hazardous waste generator storage and/or disposal facilities along the Merrimack River permitted under the Resource Conservation and Recovery Act (RCRA) program administered by the EPA. These are sources of potential contamination of the Merrimack River, however, unlike non-permitted facilities, they operate under established performance standards and are monitored by the EPA. The Massachusetts Department of Environmental Protection (DEP) has files listing all known RCRA site in the city.

Most of the toxic release sites in the city resulted from leaking underground storage tanks. Two sites are being remediated at this time. The remainder will be cleaned over time, as the process is lengthy and costly. The largest known site in Lowell is the Silresim Chemical Corporation site off Tanner Street.

The Silresim Chemical Corporation facility is currently on the national priority list for Superfund sites. The Superfund program is administered by the Federal government and is responsible for the removal and remediation activities at sites contaminated by improper waste disposal. With Superfund sites, the Federal Government will charge owners, lessors, and companies disposing of chemicals and shippers to collect money to pay for cleaning costs. The Silresim site will cost more than $40 million to clean, work began in 1994 and many companies have been named the suit to recover clean up costs. So far, the EPA has identified 223 parties as having been responsible for the hazardous wastes disposed at the facility. All will be required to pay a certain amount for the clean up.

2. Landfills

The Lowell Dump, which has recently been closed and is slated to be capped, was Lowell's primary solid waste disposal area. The dump now stands at 200 feet high and occupies 48 acres. Through a directive by DEP, the landfill has been properly capped and is being monitored to prevent harmful pollution to the groundwater from leachate and air pollution caused from methane. Because of the proximity of the site to Beaver Brook, testing is being done to ensure that leachate from the dump is not finding its way into the brook. The dump was capped with 18 inches of clay because of its relative impermeability, and a top layer of soil and grass. Ventilation systems were installed to trap and release the methane gases generated by decomposing trash. These gases are harmful and can explode under certain conditions. Upon completion of the capping and the installation of proper vapor collection systems, the dump could become a park. This alternate use has been successful in several other locations throughout the state.

3. Erosion

Erosion is not a particular problem in Lowell given the lack of steep slopes and exposed land surfaces. There is one area, however, which suffers from erosion because of dam activity near Pawtucket Falls. As a

result of raising and lowering the water level at the dam, the stream banks below the dam experience erosion as the water rushes by during water level take down.

4. Chronic Flooding

Flooding is a problem along the Concord River during heavy periods of rain. Flooding is also a problem along the northern banks of the Merrimack River near the water treatment plant. Areas of chronic flooding in the city include land around the Black Brook and the Trull brook tributary between Phoenix Avenue and Clark Road. There are several other areas around the city subject to chronic flooding. Many are located in the 100-year flood plain along major waterways of the city including the Concord River, Marginal Brook, River Meadow Brook, Beaver Brook, and Clay Pit Brook.

These wet areas provide many problems for home and business owners in the immediate vicinity through costly property damage. The city has solved some of the flooding problems and will continue to work with the other agencies to address the other areas. Fortunately, many of these areas are in the possession of the conservation commission and therefore protected from further development. The conservation commission reviews all plans for building within a flood plain and uses criteria set up in the Massachusetts Wetlands Protection Act to decide if building will be allowed. Appendix A lists the streets in Lowell shown of the FIRM maps that is partially or totally with in Special Flood Hazard Areas.

5. Sedimentation

Sedimentation and erosion have not been a particular problem for the city as much of the land is developed. Agriculture has not existed in the city for many years. Therefore, soil runoff from such operations will not affect the area's surface waters and subsequent water quality. Sedimentation poses a problem for rivers as it reduces water depth and by that raises the temperature, reduced water flow and poses health threats to fish and plant life by clogging the river.

6. Development Impact

The largest developmental impact that the City of Lowell has at this time is the use of Brownfield sites. A Brownfield site is a site where there is perceived or real contamination. Being that Lowell is an old mill city there are a considerable amount of these sites throughout the city. Since Lowell is almost built out, these sites will soon be the only sites left for development. Brownfield sites require extensive testing to make sure there is no contamination and expensive cleanup if required. In April 1994, the city successfully purchased a 20-acre parcel and developed it for use of soccer fields.

7. Ground and Surface Water Pollution

Surface water discharges to the Merrimack and its tributaries results from both public and private sources to contribute to reducing water quality. According to DEP, there are nine municipal National Pollution Discharge Elimination System (NPDES) outfalls to surface water in the city. Lowell, as with older cities, has a combined sewer and storm water system. The Lowell wastewater Treatment Plant (LWWTP) is a secondary facility, which receives wastewater from Lowell, Chelmsford, Dracut, and Tewksbury. The nine-combined sewer overflow (cso) structures that regulate flows to the LWWTP by discharging excess storm flows directly to the Merrimack River or its tributaries. As a result, the storm water runoff that combines with the raw sewerage in the drain pipes forces some of this untreated water to flow directly into the river. Seven of the overflows discharge directly into the Merrimack River, one into Beaver Brook, and one into the Concord River.

DEP also identifies eight industrial NPDES outfalls discharging into the Merrimack River or a major tributary within the city. Three of the outfalls discharge into the Merrimack River, two into the Pawtucket Canal, two into the Lower Lock Canal and one into the River Meadow Brook.

Non-point source pollution to surface and ground water supplies are caused by land use activities. Major categories of non-point source pollution affecting the waters of Lowell include urban runoff (storm drains,

combined sewers and surface runoff) and land disposal (sludge, wastewater, landfills and hazardous waste sites). While it is hard to pinpoint actual locations that contribute to surface water pollution, it is possible to identify general locations throughout Lowell where such sources of pollution could be generated.

Structural controls exist to control urban runoff to water bodies. Non-structural controls rely on actions to control sources of pollution. These include employing conservation techniques, establishing buffer zones from streams, requiring development standards to control erosion and sedimentation during construction, encouraging community activities such as recycling, waste oil collection and redesigning road salting programs. Many of these practices are being implemented in Lowell. The protection of the Concord River with a greenway park will help to reduce pollution impacts by limiting encroaching development.

One source of non-point source pollution is the extensive canal system in Lowell and the multitude of surface parking lots. Many storm drains empty into the canals transporting water to the Merrimack River. In addition, many surface parking lots and other impervious surfaces abut the canal resulting in easy collection sites for storm water runoff. Land use controls along the canals, preservation of the canal system, and greenways along the canals can help to filter out harmful pollutants and protect the water that flows through the canals. Such a program is currently underway by the Lowell Historic and Preservation Commission that aim at preserving and developing an extensive pedestrian walkway system along the canals. This plan will serve many benefits; it will protect the canals from harmful land uses, provide interpretive educational resources for park visitors and preserve an integral part of Lowell's industrial past.

SECTION 5: Inventory of Lands of Conservation and Recreation Interest

The following tables and sections inventory and describe all public and private recreation and conservation lands. MAP 5 shows the location, size and relationship of each public parcel to one another and within the city as a whole.

A. Private Parcels

1. Agricultural Lands

The City of Lowell does not have a zoning designation for agricultural land or open space. However, there is one parcel of land in the city protected under Chapter 61A regulations. This Massachusetts law allows a landowner that farms his land to pay a lower property tax. The tax is based on the land's present use (agriculture and/or horticultural) as opposed to its often more valuable future use such as residential or commercial. A landowner must have at least 5 acres of contiguous property in order to qualify. The 61A parcel is located on Varnum Road in the northwest section of the city and contains 38 acres. The landowner uses his property for the production and sale of corn. Other parcels in the city were protected under Chapter 61A but have since been withdrawn to allow for residential development. It is unlikely that any other parcels will be designated as agriculture. Preserving land for agriculture is difficult in Lowell as the alternative is too profitable and the city lacks adequate land use measures to protect such agricultural activity.

2. Forest Lands

There are no properties within the city of Lowell that qualify for Chapter 61 protection. Chapter 61 provides a tax relief mechanism for landowners of forested land. Those property owners who own more than 10 acres of contiguous land to be used for forest production can petition the state for this designation. The designation has similar requirements as Chapter 61A.

The only significant block of woodland is found in the Lowell/Dracut State Forest. There are limited blocks of tree cover around the state forest and along the river located on private parcels. However, none of the properties in Lowell are protected through Chapter 61 regulations. Much of the larger blocks of forested land were cleared away over a century ago to allow agricultural development.

3. Water Resource Protection

The City of Lowell has two major rivers; the Merrimack River and the Concord River that are areas significant for water resource protection. The Merrimack River supplies the City of Lowell, Dracut and Tewksbury with drinking water. The City of Lowell has worked very hard to clean the water of the Merrimack. In the 1970's it was considered one of the dirtiest rivers in the country. Today after years of hard work it is substantially cleaner. The fish have returned and the city now operates a beach on a section of the Merrimack.

4. Priority Areas for Rare Species and Natural Communities

The priority area for rare species in Lowell is along the Merrimack River. This area is somewhat protected under the Massachusetts Wetlands Protection Act and the Endangered Species Act but the city currently has no protection provisions of their own. There are natural rare communities within the Lowell Dracut Tyngsboro State Forest but that area is under the supervision of the Division of Conservation and Recreation

5. Less-than-Fee Interests

There are no parcels of land found in the City of Lowell that are protected under these various development restrictions. Easements are typically granted by a landowner for the benefit of the public good to provide access to a valuable recreation resource. The easement says that the landowner will not alter the land so that it will ruin its recreation or open space value. The Lowell Parks and Conservation Trust is currently reviewing parcel ownership along the Concord River to identify possible granters of trail easements.

6. Private Recreation Lands

Owners of recreational land are also eligible for taxpayer relief under state regulation. Chapter 61B applies to land not less than 5 acres that is maintained in its natural state. Allowed uses on the property include hiking, camping, nature study, boating, golfing, horseback riding, hunting, fishing, skiing, swimming, hang gliding, archery, and target shooting. In the City of Lowell, three properties are protected under Chapter 61B designation. One private country club, Mt. Pleasant Golf Course, operates an eighteen-hole course in the western part of the city, near the Chelmsford line. The second property is the United States Bunting Club, which is located on Boylston Street near the Billerica town line. Approximately 11.50 acres of this property are protected under 61B regulations. The third property is the Hole ‘N One driving range located on Phoenix Avenue. This property is 7.52 acres in size and is used for golf practice. There is another private recreational golf club located on the Lowell/Tewksbury town line. Access to the site is through Lowell, however, a majority of the property is located in Tewksbury.

7. Estates

There are no large properties in Lowell that would be classified as estates. None of the housing lots are larger than several acres.

8. Major Institutional Holdings

Several private, not-for profit institutions occupy large parcels of land throughout the city. Many of these parcels have recreational facilities on the premises that are not always open to the general public. A priority is to work with these landowners in order to open and maintain access to the facilities by the public. The Greater Lowell YMCA owns 5 acres of land. The Lowell Boys Club owns 2 acres of land that contains recreational sites. It provides sporting activities for area school age children. The Lowell Girls Club also owns several acres of land. Many religiously affiliated schools around the city own parkland for students and neighborhood residents.

The region is fortunate to have many fine hospitals that provide extensive medical care. These facilities also occupy large tracts of land. Lowell General Hospital owns 64 acres of land. St. Johns Hospital. Part

of the Saints Memorial Medical Center owns 8 acres of property adjacent to the Merrimack River. St. Joseph Hospital, the other half of the Saints Memorial Medical Campus, occupies 5.9 acres of land near the University of Massachusetts – Lowell dormitory facilities. Other large institutional landholders include the churches, private parochial schools and several non-profit groups.

B. Public and Nonprofit Parcels

1. Public Conservation and Recreation Resources

a. City-Owned Lands

This section includes all lands within the City of Lowell with current and potential conservation and recreation value to the residents of Lowell. City properties are under the management of the following authorities:

- School Department
- Parks Department
- Fire Department
- Water Department
- Department of Public Works
- Sewer Department
- Building Administrator
- Cemeteries

There are also a number of tax possessions under the jurisdictions of the city. These parcels of land and buildings could provide further recreational opportunities for neighborhood residents. Under current tax title regulations in the city a private developer can petition the city to purchase property through this program. Once the petition is made, other agencies can comment on the parcel in question and can recommend for or against the purchase. This plan recommends that when the city acquires several parcels at a time, a list and description of the parcels be circulated to various departments for comment. This will allow the recreation department to identify parcels suitable for open space use and automatically take that parcel off the list of for sale properties. By pursuing this procedure, the various departments will know firsthand what parcels are available and make provisions so that they are kept in the city's possession.

Properties belonging to Lowell that contain recreation facilities are further detailed in the Appendix of the report. State lands are predominately under the administration and management of the Department of Conservation and Recreation (DCR); University of Massachusetts – Lowell; and the Department of Public Works (DPW). DCR Properties include much of the Locks and Canal areas and the state parks. DCR maintains and operates the 1,015-acre Lowell/Dracut/Tyngsborough State Forest s well as the 118-acre Lowell heritage state park. These two sites allow a plethora of recreational and passive activities for all ages and abilities. Federal properties consist primarily of United States Government buildings including the Courthouse, Postal Facility, and National Park Service property. They comprise only a very small percentage of the land area in Lowell.

To determine the extent and need for new park facilities citywide, the open space committee applied national standards to existing facilities to identify shortcomings. This analysis was applied to all major neighborhoods. Based on this analysis, several shortfalls were identified in both acreage and number of facilities. Information listed on the following pages outlines those national standards that are used to determine additional needs for athletic and recreational facilities.

In order to meet the open space need of Lowell residents, the City has recently undertaken measures to provide additional open space and recreational use. On August 9, 2000 the City Council unanimously voted to use the proceeds from the sale of 1095 Westford Street, a commercial piece of land, for the acquisition and design of the Concord River Neighborhood Trail.

Adams Park	1.0 Acres
Bartlett Field	4.0 Acres
Cross Street Park	0.2 Acres
Moody Street Playground	1.0 Acre
North Common	3.0 Acres
Western Canal Project	4.0 Acres
Manning Field	11.0 Acres
McInerney Playground	0.35 Acres
O'Donnell Park	14.56 Acres
Alumni Field	5.50 Acres
Cawley Park	13.92 Acres
Commonwealth Avenue Playground	0.50 Acres
Fayette Street Playground	0.70 Acres
Finneral Park	0.08 Acres
Fort Hill Park	34.40 Acres
Kitteridge Park	1.80 Acres
Knott Park	1.17 Acres
Shedd Park	52.55 Acres
Stratham Playground	5.00 Acres
Lucy Larcom Park	1.27 Acres
Moody Street Playground	1.00 Acres
Christian Hill Reservoir	14.96 Acres
First Street Playground	1.48 Acres
Gage Field	21.08 Acres
Hovey Field	8.54 Acres
McPhearson Playground	8.57 Acres
Monsignor Keenan Playground	0.33 Acres
St. Louis Playground	9.30 Acres
Varnum Park	0.50 Acres
Veterans Memorial Park	0.09 Acres
Carter Street Playground	0.50 Acres
Concord Riverbank Park	2.72 Acres
Ducharme Park	0.51 Acres
Father Kirwin Park	1.54 Acres
Oliveria Park	1.83 Acres
Rotary Club Park	0.86 Acres
South Common	20.31 Acres

Amory Park	0.75 Acres
Avenue A Playground	2.78 Acres
Callery Park	5.50 Acres
Colburn Park	0.25 Acres
Daley School Field	12.0 Acres
Doane Street Park	1.40 Acres
Durkin Playground	1.55 Acres
Hadley Field	5.88 Acres
Highland Park	19.6 Acres
Lincoln Square Park	0.50 Acres
Morey Street Playground	1.20 Acres
Perry Playground	0.32 Acres
Tyler Park	2.00 Acres
Clemente Park	3.00 Acres
Crowley Park	0.50 Acres
Edwards Soccer Field	8.00 Acres

Bourgeois Park	0.25 Acres
Campbell Park	2.53 Acres
Father McGuire Playground	4.58 Acres
Fells Playground	0.30 Acres
Flaggies Park	4.50 Acres
LeBlanc Park	60.0 Acres
Pawtucket Memorial Park	1.20 Acres
Wang Parcel	20.0 Acres
Wannalancit Park	2.00 Acres

A vital asset to this neighborhood, Lowell and the towns of Dracut and Tyngsborough is the presence of the 1,015-acre Lowell/Dracut/Tyngsborough State Forest located in the northwest portion of Lowell. This major park provides a variety of recreational opportunities such as biking and mountain biking, hiking, nature walking, picnicking, fishing, field sports and winter sports such as ice skating, sledding, cross-country skiing, and birding. The city has also recently acquired the 20-acre former Wang Company parcel on the northern bank of the Merrimack River near the M/A Com building. This acquisition is a valuable addition to the current mix of recreational properties as wall as remedying the loss due to the school construction program. The city would like to use the facility for outing, picnicking, weddings, and church related events on the weekends and playing fields during the week. The city currently lacks a large area where groups can meet and use the athletic fields. This parcel will also be ideal for those events as it has restroom facilities and has parking available for large groups. In addition, the City of Lowell Water Department has agreed too transfer ownership of a 12 acre parcel to the Parks and Recreation Department for use as new recreational fields and picnic space to serve the many condominium properties in the Northwest section of the city.

The above listing describes open space and parks in the city. This is not a complete listing of city owned land. It only describes the available parks and recreation land available to all residents.

b. State-Owned Lands

The Commonwealth of Massachusetts owns many parcels of land throughout the city for use by various agencies. The DCR, the University of Massachusetts – Lowell and the DPW collectively manage all of the state owned properties. All of the DCR holdings are associated with the Lowell/Dracut/Tyngsborough State Forest, the canal system and the Merrimack River Heritage Park system. The DPW maintains several parcels along the river as open space. See Appendix B for a complete list of state owned parcels in Lowell and the resource they provide. The Lowell Department of Planning and Development is petitioning the state to transfer the title of several parcels of land along the Merrimack River to DCR. This will enable DCR to complete construction of a riverwalk path that begins near the Duck Island Treatment Plant and ends near the Tyngsborough town line. This recreational link will greatly enhance opportunities for residents north of the Merrimack River. It will provide almost a continuous park along the north bank of the river providing a site for beach activities, walking, running, picnicking and will include a new boat launch.

2. Non-profit Lands

The Lowell Parks and Conservation Trust, a local land trust, owns the following property
Spalding House - 5,000 sq. ft
Totman Road - 69,024 sq. ft
181 W. Meadow - 3.85 acres
36 Merrill St. - Jollene Dubner Park (part of) - 2700 sq. ft
16 Nicole Drive - 1.88 acres

3. Other Public, Unprotected Lands

The University of Massachusetts- Lowell is a major landholder in the city. The State University occupies approximately 155 acres of land that it uses for academic, housing university support and recreational facilities. The university has embarked on an expansion plan to be called the Mill campus, which will result in the development o 31.3 acres of industrially zoned land. The land, previously occupied by the Lawrence Manufacturing Company, will be stripped clean of many buildings and surface parking lots on the site. Some of the buildings of historical significance will be renovated for university use. In its place, the university will construct several academic buildings, dormitories, offices and a student center.

As part of the recreational component, a field house and swimming pool will be added to provide more facilities for students, faculty, employees and area residents. The plan also calls for extensive use of pedestrian links around the campus buildings to minimize vehicle traffic. Other added recreational facilities include 3 new tennis courts, a baseball diamond, and a football/soccer field. The university also owns a four-acre parcel along the north side of the river that currently houses a soccer field. This area sees heavy use by area soccer league. Unfortunately, this parcel of land, located in the floodplain, is subject to seasonal flooding.

The region is fortunate to have many fine hospitals that provide extensive medical care. These facilities also occupy large tracts of land. Lowell General Hospital owns 64 acres of land. St. Johns Hospital. Part of the Saints Memorial Medical Center owns 8 acres of property adjacent to the Merrimack River. St. Joseph Hospital, the other half of the Saints Memorial Medical Campus, occupies 5.9 acres of land near the University of Massachusetts – Lowell dormitory facilities. Other large institutional landholders include the churches, private parochial schools and several non-profit groups.

SECTION 6: COMMUNITY VISION

A. Description of Process

The City of Lowell's Division of Planning and Development designed an open space and recreation survey in 2002. The survey was based on a model in "Parks, Recreation, Open Space and Greenway Guidelines" by Mertes and Hall. The City received a grant as part of the Route 3 widening project and hired consultants at Davidson-Peterson Associates (DPA) of Kennebunk, Maine, to conduct phone interviews using the survey. DPA surveyed a total of 261 Lowell residents on November 1st and November 10th in 2002. The interviews were designed to reach a wide range of people and were conducted in English, Spanish and Khmer. A total of 224 of the respondents were recruited at random. In addition a listed sample of Cambodians was used to augment and assure a robust sample of this ethnic group. A total of 37 Cambodian respondents were recruited through the purchase of a phone list.

In March of 2005, the City held a public meeting to present a draft of the goals and objectives of the Open Space Plan. Notices were put in the local newspaper and sent to the various neighborhood organizations to inform residents about the meeting. Interested members of the public and neighborhood representatives were present and contributed constructive feedback and comments. A draft was placed online on the City's website to solicit further feedback from the public. The City accepted public comments throughout the month of April after the draft was first presented in March.

B. Statement of Open Space and Recreation Goals

The City of Lowell is heavily built out leaving few opportunities for the City to create new open spaces. The City must actively pursue actions to acquire more open space and preserve environmentally sensitive areas. Lowell plans to continue its progress on creating a trail system throughout the city. Another goal is to maintain the parks that we currently have and spend more money on supervised recreational activities within existing parks.

SECTION 7: ANALYSIS OF NEEDS

The Open Space Plan need analysis for Lowell reviews existing conservation and recreation resources and identifies area requiring further attention from the city. Conservation and recreation are interrelated in that both function are considered open space uses and are increasingly necessary for municipalities to provide and plan for as population changes. Conservation and recreation uses can occur at the same location. For instance a riverbank corridor can serve a conservation purpose by protecting the river from runoff and over development while also providing hiking and/or mountain biking corridor or a tranquil place for fishing or bird watching.

A unique aspect of open space preservation is that it provides two simultaneous benefits: on the one hand open space can provide playing fields and walking paths while at the same time protecting the valuable surface and subsurface natural resources such as wildlife habitats and ground water. Open space protection also serves other important functions such as protecting valuable habitat, reducing government services by preventing residential services and increasing property values for adjacent landowners.

A. Summary of Resource Protection Needs

Resource protection is based on the need to protect existing natural and cultural resources that are finite in quantity and are irreplaceable. Wetlands, rivers, streams, aquifers, historical resources, and scenic views all encourage outdoor activity and are pleasing to the beholder. However, once they are destroyed by manmade activities, they cannot be replaced. The resources that natural environments provide are forever lost, destroying any use by future generations. Efforts at the local level must be directed to preserve the remaining natural resources of Lowell so that our future children will be able to enjoy and appreciate the qualities that are taken for granted by present generation.

While some wetland areas in Lowell are part of city or state-owned property, this does not guarantee that they are fully protected from encroachment. More significantly, most of the wetlands in Lowell are on privately owned land where the impact from development is far greater. Because there are so few wetlands remaining in the City, strong protection measures should be instituted to prevent further degradation. Current wetland regulations protect wetlands from hazardous encroachment to an extent, but the best policy for protecting this resource is to have a permanent conservation easement placed on the property containing the wetland resource.

The supply of drinking water for the City is taken from the Merrimack River and distributed to all users in Lowell. Surface water from the Merrimack and Concord Rivers is also a vital recreation resource. Therefore, maintaining high water quality standards is important and should be a top priority of Lowell's open space goals. Water quality has been a particular problem in the past as upstream discharges as well as users in the City have contributed to its poor quality. However, local, regional, state, and Federal efforts have resulted in significant clean up of the Merrimack River. The recent completion of waste- water treatment plants in Nashua and Manchester, NH has greatly improved water quality.

The Concord River also has pollution problems because of municipal and industrial waste discharges. Lowell not only needs to concern itself with discharges in its own boundaries but discharges from upstream users in Billerica. Lowell needs to monitor the proper operation of standards. The Concord River is a valuable recreation resource and is need of greater attention if it is to remain an important component. Since the quality of Lowell's surface water depends significantly on upstream activities, the City should establish a system to monitor pollution and strive to establish appropriate controls on upstream polluters. Such measures will help maintain water quality and allow continued use of the river by all users.

Many recreational activities are dependent upon clean water such as swimming, sailing, fishing, rowing, and canoeing. The Vandenberg Esplanade Boathouse, in the Lowell Heritage State Park, is a major recreational resource along the river. Whitewater rafting, which has recently become a popular springtime activity on the Concord River, is also only possible with clean water. One tour group offers white water rafting trips on the Concord River every Saturday and Sunday from early April to mid or late May, depending upon how long high water levels last. The excursion lasts one hour. For a few weeks in April and May when the water is running high, the Concord River provides the best white water rafting in New England. The Billerica Street canoe launch allows for canoeing on the Concord River. The City's canal

system is a major tourist attraction for visitors of the Lowell National and State Historic Park. With barge tours being a primary component of the experience, water quality is of utmost concern and attention should be focused in this area. The recreational economy of Lowell depends heavily upon clean water.

Periodic flooding in Lowell causes severe and expensive property damage. As in many urban areas, Lowell's floodplains, which generally form a corridor along the waterways, have been built upon. This has exacerbated the flooding problems as wetlands, which provide valuable flood storage, are filled to allow more development. The Black Brook watershed and its chronic flooding problems, is a classic example of improper filling of a floodplain area. Lowell needs to develop stricter regulatory controls over development in the floodplains to maintain important riverfront open space and to reduce the damage caused by flooding.

Scenic locations and historical properties are resources that shape the city's character and are likely to promote the resident's interest and pride in their surroundings. Pleasant landscapes and historic areas, however, are easily destroyed when the values they represent are not recognized and actions are not taken to protect them.

Lowell has set a national precedent in its effort to maintain the historical buildings and canals that marked the beginning of the Industrial Revolution in America. A National and State park as well as local Historic Districts have been formed to maintain historic structures and to educate the general public about the importance of the technological advances developed during this period of history. Tours of these important areas are provided by the National Park Service and are valuable tools in promoting interest in Lowell's history. Other properties identified, as having historic significance should be protected through incorporation into historic districts, individual landmarks, or as neighborhood review districts, which require applications for historic preservation. (See Appendix) The Lowell Historic Board, for example, has mandated in their enabling legislation the ability to establish new districts and develop neighborhood district standards to protect the character of historic areas such as Washington Square. The initiative for such actions, however, should originate in the neighborhoods.

The Merrimack River is classified as a scenic river over its length through Massachusetts. The Pawtucket Falls is an especially dynamic area where the power of the falling water over the dam can be seen and heard. Because of this geological occurrence, this area of the river provides excellent fishing for local enthusiasts. The Concord River is also designated as a scenic classification terminates in Lowell. Lowell should seek a scenic river designation for its stretch of the Concord River. Efforts should be made to promote enhancement of the river's quality and appearance in order to aid in securing this designation.

When driving in Lowell on the Lowell Connector, dense vegetation along the east side of the highway provides a pleasant natural screen. The vegetation grows along the banks of River Meadow Brook. Although the brook is too polluted for recreational use, the vegetation significantly improves views from the Lowell Connector and should be recognized and protected for that purpose.

Lowell's rivers, streams, and canals are among the City's most significant scenic features. These scenic values, as well as the conservation values, must be protected and enhanced by the City through the establishment of River Protection Districts, easements, and land acquisition programs. The banks of a majority of the rivers and streams are littered with refuse. Extension of the Lowell Pride Adopt-an- Island Program should be expanded to include Adopt-a-Stream program to encourage routine clean up by business and civic groups. Through this effort, the appearance and to discourage further dumping into the water bodies.

In addition to its rivers, Lowell's parks are also significant cultural and historical resources. Lucy Larcum Park, the City's first park was dedicated to preserving "breathing spaces" in the city as mills and boarding houses rapidly developed. North and South Commons were set aside for similar reasons. Several of Lowell's parks were developed by the landscape architecture firm of Frederick Law Olmstead. Tyler Park, which is part of a neighborhood, which was nominated and accepted as a National Register Historic District, was designed by Charles Eliot, Olmsted's partner. The firm also worked on Rogers Fort Hill Park,

Belvidere Park, North and South Commons, Pawtucket Boulevard and Monument Square. These parks need to be recognized and publicized as important cultural resources and for their historical value.

B. Summary of Community's Recreational Needs

The City of Lowell currently has 322 acres of public open space dispersed throughout the city. This total does not include the 1,015-acre Lowell/Dracut/Tyngsborough State Forest, of which 259 acres are located in the city.

Based on a 2000 study the following activities are available in Lowell:

Recreational Activities in Lowell

Activity	Number of Facilities
Basketball Courts	39
Lighted	26
Unlighted	13
Handball Courts	4
Lighted	2
Unlighted	2
Softball Fields	23
Lighted	7
Unlighted	16
Tennis Courts	29
Lighted	20
Unlighted	9
Swimming Pools	9
Tracks	5
Volleyball Courts	8
Baseball Fields	27
Lighted	7
Unlighted	20
Football / Soccer Field	13
Lighted	6
Unlighted	7
Skateboard Parks	3

The majority of Lowell residents, 84%, participate in some recreation activities in Lowell. Most say that they walk or jog in the city at least once a year. Those who do participate in this activity do so frequently. Half say they walk or jog many times a year. The majority, 79%, also attend special event in Lowell's Parks at least once a year 49% say they attend an event a few times a year or more,

Residents feel that having sufficient recreational space is important, particularly for children. A majority, 76%, feels that providing play area for our youth is important. Fewer, but still more than half (57%), feel that offering recreational facilities for adults is important.

A majority of Lowell residents, 75%, also feel that preserving environmentally sensitive areas is important. Slightly fewer, 72%, feel creating more natural areas such as parks and gardens is important. 69% felt that we need to plant more trees and flowers on city property.

Two thirds of residents feel that protecting open space in Lowell is important. However this is not as important to them as most other factors exposed in this research, such as cleanup and maintenance of the neighborhood and building natural areas.

Residents of the city of Lowell would like the city to fix up existing parks and recreational areas or develop vacant, undeveloped, city owned land into new parks and recreational areas as opposed to purchasing land in developing areas to create new parks and recreational areas. 64% of residents would rather see more money spent on supervised recreation activities with the existing parks than on developing new parks and recreational areas.

Response from survey regarding Spending More of Less on Activities in Lowell

Activity	Spend More %	Spend Less %
Children's Playgrounds	57	4
Recreation Centers	57	4
Nature Areas	50	4
Open Play Areas	48	4
Jogging and Exercise Trails	42	9
Bicycle Trails	41	8
Beach Parks	36	10
Ball Fields	34	11
Basketball Courts	33	8
Swimming Pools	32	9
Skateboard Parks	28	24
Volleyball Courts	17	19
Boat Ramps	16	22
Tennis Courts	14	24

C. Management Needs, Potential Change of Use

The City of Lowell employs a site plan review ordinance to review all development projects of a certain size. This ensures that projects of significance can be reviewed by all departments so that concerns can be addressed in a central location and incorporated into planning board recommendations. The site plan review ordinance requires that the Division of Planning and Development, Engineering Department, Board of Health, Conservation Commission, Fire Department and Water Department review all projects that involve construction of more than 10,000 square feet or exceed six residential dwelling units for on subdivision. This cooperative agreement ensures that all major projects receive the needed scrutiny necessary to prevent potentially harmful or hazardous projects.

There is also a sever lack of communication with neighboring communities regarding developments of regional significance. In some cases a neighboring community might have land zoned for industrial use while in the adjacent community the land could be zoned for open space. These two abutting land uses do not conform and the industrial use could negatively impact the open space. Therefore it is important that communities attempt to solve these differences so that protection does not stop at the town line. The city and towns need to work closely when important projects are submitted that could impede other communities of the region.

SECTION 8: GOALS AND OBJECTIVES

The City of Lowell has identified the following goals and objectives to provide high quality recreational facilities and to protect the City's natural and cultural resources. The goals presented are in no particular order of priority. The goals and objectives established in this plan have incorporated the views and concerns of the citizens of Lowell and take into account the unique natural and cultural resources of the City.

Goal 1

Provide a balance of high quality active and passive recreational opportunities for all individuals throughout the City.

Objectives

- Continue the creation of mini parks throughout the City.
- Encourage public agencies to share facilities.
- Look for year round use of facilities.
- Improve access to recreational spaces (e.g. State Forest).

Goal 2

Develop and maintain existing parks and open spaces.

Objectives

- Continue to follow the recommendations and guidelines set forth in the Parks Department Maintenance Management Plan.
- Support updating of the various parks that the city already owns.
- Identify the parks that are not being used to their potential.

Goal 3

Integrate Lowell's Open Space Plan with regional open space plans.

Objectives

- Ensure regional bike trails are visible in the City through proper signage.
- Encourage the development of trail systems within the city that link with regional systems outside of the City.
- Assist in the development of the Concord River Neighborhood Trail as proposed by the Lowell Parks and Conservation Trust.
- Seek funding for the Merrimack River interceptor trail between Lowell and Tewksbury.

Goal 4

Identify, preserve and protect Lowell's heritage and ecologically sensitive areas

Objectives

- Continue to work with the Massachusetts Historical Commission and the Lowell Historic Board to designate federal or local historic districts.
- Continue efforts through federal, state and local resources for the preservation and enhancement of the canal systems.
- Work with Massachusetts Historical Commission and the Massachusetts Natural Heritage and Endangered Species program to identify sensitive areas.
- Establish a program for procuring funds to acquire, protect or improve sensitive areas.
- Create a bicycle map identifying historical and natural resource areas of the City.
- Develop a database of all vacant public and private properties with natural resource value, recreation potential or historical interest.
- Continue communicating with federal, state and local agencies regarding rules and regulations regarding wildlife habitats and water resources.
- Involve UMass Lowell with identifying environmental resources.
- Work with the National Park Service to create pedestrian trails and links to Riverwalk from the Downtown.

Goal 5

Preserve, protect and enhance wetlands, ground water quality, and freshwater wildlife habitats.

Objectives

- Continue to uphold and promote the Massachusetts Wetlands Protection Act.
- Acquire wetlands identified as having particular importance by fee, easement, restriction, donation or exchange.
- Preserve and protect Lowell's water supply for public health.
- Support the efforts of the City to fix the Combined Sewer Overflow issue.
- Implement a conservation and open space zoning district.

Goal 6

Encourage an overall "greening" of the City

Objectives

- Support the implementation of the Lowell Tree Ordinance.
- Conduct a hazard tree inventory.
- Develop a memorial tree program.
- Continue to support the Lowell Parks and Conservation Trust in their street tree planting program.
- Continue supporting local land trusts and nonprofits in acquiring and preserving community open space.
- Continue the summer hanging plant program in the Downtown.
- Work with developers especially of large projects to improve landscaping.
- Encourage mini parks and pedestrian trails in the Hamilton Canal District project.
- Focus on the greening of major gateways into the City.

Goal 7

Unite the people of the City through recreational services

Objectives

- Support the Special Events Coordinator with the numerous festivals held within the City.
- Support the Executive Director of the Cultural Organization of Lowell.
- Create community gardens and plant trees in denser neighborhoods.
- Support updating of facilities at Cawley Stadium.

SECTION 9: FIVE YEAR ACTION PLAN

The heart of any plan lies within its recommended course of action. The five-year action schedule found in this section is a recommended sequence of steps that Lowell officials and residents should follow to achieve the goals and objectives noted throughout the plan.

Lowell is a dynamic city with outstanding natural and cultural resources such as the Merrimack and Concord Rivers, an ethnically diverse population and a strong historical heritage. These and other features of the city provide unique opportunities for open space use and preservation, to which Lowell has demonstrated a commitment, as it looks ahead to the city's future.

Goal 1

Provide a balance of high quality active and passive recreational opportunities for all individuals throughout the City.

Year
1 2 3 4 5 Actions

Goal 2

Develop and maintain existing parks and open spaces.

Year
1 2 3 4 5 Actions

Goal 3

Integrate Lowell's Open Space Plan with regional open space plans.

Year
1 2 3 4 5 Actions

Goal 4

Identify, preserve and protect Lowell's heritage and ecologically sensitive areas

Year
1 2 3 4 5 Actions

Goal 5

Preserve, protect and enhance wetlands, ground water quality, and freshwater wildlife habitats.

Year
1 2 3 4 5 Actions

Goal 6

Encourage an overall "greening" of the City

Year
1 2 3 4 5 Actions

Goal 7

Unite the people of the City through recreational services

Year
1 2 3 4 5 Actions

SECTION 10: PUBLIC COMMENTS

Plan Approval

Local Review

Required Format

SECTION 11: REFERENCES

The following sources were used to complete the 2004 Open Space and Recreation Plan

City of Lowell Division of Planning and Development
City of Lowell Parks and Recreation Department
City of Lowell Engineering Department
City of Lowell Water Department
City of Lowell Assessors Department
City of Lowell Historic Board

Appendix A

Streets in Lowell with Chronic Flooding Problems
As determined by the Federal Emergency Management Agency

Acton Street	East Avenue	Parkview Avenue
Aiken Street	East Industrial Avenue	Pawtucket Drive
Alcott Street	Eleanor Drive	Pawtucket Street
Bachman Street	Father Morrissette Boulevard	Pershing Street
Baldwin Street	Felker Street	Phoenix Avenue
Beaver Street	Hadley Street	Plain Street
Bedford Avenue	Howard Street	Pratt Street
Berkeley Avenue	Industrial Avenue	Princeton Street
Billerica Street	Industrial Avenue East	Reiss Avenue
Bolton Street	Joffre Street	Riverview Avenue
Bridge Street	Lafayette Street	Rosemont Street
Broadway Street	Lawrence Street	Sayles Street
Burnside Street	Lexington Avenue	School Street
Cabot Street	Lincoln Street	Shirley Avenue
Caleb Street	Locust Street	Sparks Street
Campaw Street	Magnolia Street	Stockbridge Street
Central Street	Malden Street	Suffolk Street
Clifton Street	Market Street	Tower Drive
Commonwealth Avenue	Martin Street	Townsend Drive
Cornell Street	Melrose Avenue	Webber Street
Cricket Club Road	Merrimack Street	Wentwoth Avenue
Crosby Street	Middlesex Street	West Aldea Street
Delaware Avenue	Moody Street	Western Avenue
Delmont Avenue	New York Street	Westmoreland Street
Dunbar Avenue	Newhall Street	Whipple Street
Duren Avenue	Old Ferry Road	Windward Road
Dutton Street	Ostrander Avenue	Winslow Avenue
East Aldea Street	Ottawa Street	Wood Street